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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/692,075	10/19/2000	Ken Harris	22176	6304

29127 7590 12/13/2006

HOUSTON ELISEEVA
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LEXINGTON, MA 02421

EXAMINER	
ANGEBRANNDT, MARTIN J	

ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 12/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
09/692075			

EXAMINER	
ART UNIT	PAPER
	20061129

DATE MAILED:

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Commissioner for Patents

Examiner Angebranndt contacted Maria Eliseeva regarding the lack of a response to the mailing of 04/07/06 and was informed that the two pages setting forth that the brief was defective and setting the period form response were not recieved. The remainder of the mailing was received. The period is restarted with this mailing. This mailing includes the entire document sent 4/7/06 including both portions received and not received. The two missing pages were sent by facsimile to 781-863-9931 on 11/29/06.

Martin J Angebranndt
Primary Examiner
Art Unit: 1756

Interview Summary	Application No.	Applicant(s)	
	09/692,075	HARRIS, KEN	
	Examiner	Art Unit	
	Martin J. Angebranndt	1756	

All participants (applicant, applicant's representative, PTO personnel):

(1) *Martin J. Angebranndt*. (3)_____.

(2) *Maria Eliseeva (35900)*. (4)_____.

Date of Interview: *29 November 2006*.

Type: a)☒ Telephonic b)☐ Video Conference
c)☐ Personal [copy given to: 1)☐ applicant 2)☐ applicant's representative]

Exhibit shown or demonstration conducted: d)☐ Yes e)☒ No.
If Yes, brief description: _____.

Claim(s) discussed: *N/A*.

Identification of prior art discussed: *N/A*.

Agreement with respect to the claims f)☐ was reached. g)☐ was not reached. h)☒ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: *Examiner Angebranndt contacted Maria Eliseeva regarding the lack of a response to the mailing of 04/07/06 and was informed that the two pages setting forth that the brief was defective and setting the period form response were not recieved. The remainder of the mailing was received. The period is restarted with this mailing.* .

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN A NON-EXTENDABLE PERIOD OF THE LONGER OF ONE MONTH OR THIRTY DAYS FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

Examiner's signature, if required

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)
In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/692,075
Filing Date: October 19, 2000
Appellant(s): HARRIS, KEN

Maria M. Eliseeva (43,328)
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed July 8, 2005 appealing from the Office action mailed June 6, 2004.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The applicant states that there are no related appeals or interferences.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is incorrect.

The amendment after final rejection filed on August 03/2004 has been entered.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is incorrect as claim 26 is not a clean copy and the subparagraphs in claims 28 and 29 should be (a) through (f).

(8) Evidence Relied Upon

The following is a listing of the evidence (e.g., patents, publications, Official Notice, and admitted prior art) relied upon in the rejection of claims under appeal.

5,279,689	Shvartsman	01/1994
5,104,768	Sassmannshausen et al.	04/1992
5,521,030	McGrew	05/1996

0766142	Fan et al. (European Patent, in English)	04/1997
5,452,282	Abraham	09/1995
6,010,825	Hagen et al.	01/2000
5,374,469	Hino et al.	12/1994
08-039572	Kataoka et al. (Japan) (with machine translation)	02/1996
IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393		08/1987

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

A) Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987), in view of Shvartsman '689 and Kataoka et al. JP 08-039572.

IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987) teaches the formation of a holographic surface relief grating including spin coating a photosensitive polyimide to form a uniform coating (no seams), pre-baking at 85 degrees C, exposing the polyimide with light from a HeCd laser to record the holographic image (at room temperature), and a postbaking/development at 225 degrees C. The polyimide allows dry or wet development, which is disclosed as an advantage.

Shvartsman '689 describes the coating of a photohardenable film on a substrate , embossing a pattern into it , curing it while in contact, peeling and transferring the relief image in the photohardened film to another surface by stamping. (8/56-9/21) The use of roller or flat die

shapes is disclosed. (9/22-55). See also the examples. Holograms can include images and or text stored holographically.

Kataoka et al. JP 08-039572 (machine translation attached) teaches the use of a patterned photosensitive polyimide on the interior surface of a mold. These are pre-heated at 50 degrees and post-baked at 240 degrees in the examples. [0031].

It would have been obvious to modify the process of IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987) as discussed above, by forming a surface relief hologram in the photosensitive polyimide formed on the flat surface by contacting it with a relief holographic surface and partially curing it to hold the relief pattern, removing it from the relief pattern, postbaking it and later using it to replicate itself in other materials as stamping is disclosed as Shvartsman '689 and Kataoka et al. JP 08-039572 who establish that cured photosensitive layers, including polyimides are known to be useful as masters for stamping and molding and the teachings of the preexposure bake (solvent removal) and post expopusre bake by Kataoka et al.JP 08-039572 and evidence of the use of embossing of the photosensitive layer and curing it while in contact with the master as taught by Shvartsman '689 as this allows more rapid hologram formation than using the exposure and development process of IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987) as it obviates the use of a development step to achieve the relief image.

The applicant previously argued that spin coating a used in the IBM reference does not refer to the spin coating on the roller as contemplated by the claims. The applicant also argues that wet development is taught away from. The applicant also points out that heat curing is not

taught by Schvartsman et al. The applicant also argues that the material of Schvartsman et al. cannot be imaged by light.

The examiner notes that claim 26 is not limited to spinning a roller and that the term "spin coating" is broader than argued by the applicant. The manner in which the applicant uses the term is unusual, but not repugnant to the accepting meaning of the language. The examiner notes that claim 26 does not even include a recitation of "spin coating", "wet development" or "heat curing" and therefore these argument are not commensurate with the scope of coverage sought. The materials of Schvartsman are photoresist materials, in particularly negative acting acrylate materials and inherently undergo hardening and insolubilization in response to light (4/1-15 in Schvartsman et al.). Therefore the argument that the Schvartsman materials cannot be imaged by light is flawed.

B) Claims 28,33,35 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sassmannshausen et al. '768, in view of IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987), Shvartsman '689, Kataoka et al. JP 08-039572, Fan et al. EP 0766142 and McGrew '030.

Sassmannshausen et al. '768 teaches the use of *positive acting polyimide* resists for fabricating relief structures useful in fabricating microelectronics and printing plates. (1/11-30). Processing of the polyimide resists includes coating, pre-baking at 50-120 degrees C, exposure (at room temperature), aqueous alkaline development and post-baking at 200-400 degrees C. (6/23-7/39).

Fan et al. EP 0766142 describes seamless resist coatings, which are useful for forming seamless printing plates. (5/9-17). The use of printing cylinders allows continuous printing. (2/30-34)

McGrew '030 discloses that the transfer layer may be a **photo**resist applied to the roller from a tank of liquid photoresist, which would not leave a seam in the photosensitive coating allowing continuous embossing (2/58-59) and is disclosed as useful in the printing arts. (4/26-38). The use of **positive resist** is disclosed (3/57-62) After development of the pattern, the pattern may be transferred into the underlying layer by etching. See figures 4-8 concerning light exposure of the resist.

It would have been obvious to one skilled in the art to modify the processes of Sassmannshausen et al. '768 including the pre-exposure and post exposure baking and using the resultant polyimide print surface to form an embossed grating surface in another surface based upon the use of polyimides to form gratings using interferometric exposure as evidenced by IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987) and the use of polyimides and other resists to mold/emboss other soft materials as taught by Shvartsman '689, Kataoka et al. JP 08-039572 coated on rollers based upon the ability to perform continuous printing and to use the coating processes of McGrew '030 which are disclosed as useful in the printing arts by Fan et al. EP 0766142.

In addition to the response provided above, the examiner point to the fact that the Fan et al. EP 0766142 and McGrew '030 references teach the same roller coating process described by the applicant in the instant specification as "spin coating" and clearly indicate the seamless

nature of the coating. Further the teachings of Fan et al. EP 0766142 and McGrew '030 serve to establish the analogous nature of the printing and embossing arts.

C) Claims 28,32,33,35 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sassmannshausen et al. '768, in view of IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987), Shvartsman '689, Kataoka et al. JP 08-039572, Fan et al. EP 0766142 and McGrew '030, and further in view of Abraham '282.

Abraham '282 teaches the formation of dot matrix gratings or regular gratings in photoresists and the use of these as stampers. (3/11-50)

In addition to the basis provided above, the examiner holds that it would have been obvious to use the processes Sassmannshausen et al. '768 combined with IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987), Shvartsman '689, Kataoka et al. JP 08-039572, Fan et al. EP 0766142 and McGrew '030., such as dot matrix holograms as the image to be formed in the stampers based upon the teachings of the formation of these holograms in stamper surfaces by Abraham '282.

D) Claims 28,33-36 and 43-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sassmannshausen et al. '768, in view of IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987), Shvartsman '689, Kataoka et al. JP 08-039572, Fan et al. EP 0766142 and McGrew '030, and further in view of Hino et al. '469 and/or Hagan et al. '825.

Hino et al. '469 teach that if the heating temperature is below 400 degrees C, that imidization does not sufficiently proceed and that to correct for this curing takes place under a nitrogen atmosphere (8/1-14).

Hagan et al. '825 teach the use of negative polyimide resists which are aqueous developable (16/11-37). This is described as an advantage over other polyimides, which cannot use aqueous developers. The use of these compositions in forming microelectronics, photoresists and prinint plates is disclosed. (17/30-37).

It would have been obvious to modify the invention of Sassmannshausen et al. '768, combined with IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987), Shvartsman '689, Kataoka et al. JP 08-039572, Fan et al. EP 0766142 and McGrew '030 as discussed above by curing under a nitrogen atmosphere to ensure sufficient imidization as taught by Hino et al. '469 and/or the use a negative polymide resist which shares the advantage that it is developable using a aqueous developer. There is no evidence that the polarity (negative acting or positive acting) of the polyimide has any advantage.

(10) Response to Argument

The applicant argues that the examiner has relied improperly upon "common knowledge and common sense" without support from the references. The examiner disagrees, noting that IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987) and Shvartsman '689 are analogous due to their disclosures concerning the formation of holographic images in photoresist materials. IBM Technical Disclosure Bulletin Vol. 30(3) pp. 1392-1393 (08/1987) and Kataoka et al. JP 08-039572 are related due to their use of polyimide materials and the processing of

polyimides. Shvartsman '689 and Kataoka et al. JP 08-039572 are related by their disclosed concerning the use of photoresist materials in molding/embossing resinous materials. Therefore the references used in the rejection of claim 26 are analogous, teach alternative resist materials for forming embossing surfaces having equivalent functionality and alternative means for forming the holographic relief pattern (ie exposure and development, vs partial curing in contact with a relief surface), conventional processing of polyimide materials (pre-exposure bake and post exposure baking) and present evidence leading one of ordinary skill in the art to a reasonable expectation of success in the performance of the modified process. The rejection stands.

B) The assertion that the Fan et al. references is uncombinable with the other references due to the low temperature of heating, neglects the essence of the rejection which uses a polyimide material which is processed at higher temperatures, rather than the resist specifically used in the examples of Fan et al., which deforms at high temperatures. It would not be reasonable to one skilled in the art to use processing conditions optimized for one resist, with another. Therefore the assertion that the heating of the other references is incongruent with the processing conditions of Fan et al. is misguided and misses the use of polyimides asserted in the rejection. The rejection stands.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

3/28/06

Martin J. Angebranndt
Primary Examiner, Art Unit 1756

Conferees:

Mark F. Huff
Supervisory Patent Examiner
Art Unit 1756

Patrick J. Ryan
Supervisory Patent Examiner
Art Unit 1745

Notice of References Cited	Application/Control No. 09/692,075	Applicant(s)/Patent Under Reexamination HARRIS, KEN	
	Examiner Martin J. Angebranndt	Art Unit 1756	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-			
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	machine translation of JP 08-039572
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the process of the molding die of synthetic resin. Furthermore, it is related with the process of the metal mold used for shaping of injection molding which obtains the mold goods which have a crimp-like detailed irregularity front face in detail, blow molding, etc.
[0002]
[Description of the Prior Art] In order to obtain the mold goods which have detailed irregularity front faces, such as the shape of the shape of a hide crimp, and a hairline, a metal mold front face injects thermoplastics to an above-mentioned detailed concave convex metal mold cavity, and is fabricated. In order to improve repeatability in the configuration grant on the front face of a mold, it can attain to some extent by making resin temperature high or usually choosing a process condition, such as making an injection pressure high. It is a die temperature to have the biggest influence in a process condition, and it is so desirable that a die temperature is made high. However, if a die temperature is made high, a cooldown delay required for the cooling solidification of resin by which heating plasticization was carried out will become long, and the rate of forming performance will fall.
[0003] The approach a required cooldown delay does not become long even if it improves repeatability on the front face of a mold and makes a die temperature high, without making a die temperature high is demanded. Although the approach of attaching the object for heating and the hole for cooling in metal mold, respectively, pouring a heat carrier and a refrigerant by turns, and repeating heating of metal mold and cooling is also performed, this approach also has much consumption of heat and a cooldown delay becomes long.
[0004] It is required that the mold goods which the cooldown delay in metal mold did not become long, and improved metal mold surface repeatability should be fabricated injection molding having the greatest advantage in the mold goods of a complicated configuration being once obtained with shaping, and holding this advantage. Also in blow molding, it is the same. About the metal mold which already made the thermal break front face of thermal break covering metal mold the shape of a crimp, and its process, we proposed by JP,6-143294,A. In order to make that front face into the shape of a crimp in this, using the amount polyimide of straight chain mold giant molecules as a thermal break, etching with a strong-base solution is shown.
[0005]
[Problem(s) to be Solved by the Invention] the metal mold with which the technical problem of this invention covered the metal-mold front face with the thermal break -- setting -- 1 -- 3 with small increase of two cooldown delays applicable to the metal mold which has the metal mold cavity of a complicated configuration -- it is offering the approach of manufacturing economically the metal mold which is equal to tens of thousands of repetition shaping and which can attain ** excellent in 4 metal-mold surface repeatability from which the mold goods which have a crimp-like front face etc. are obtained. This invention is offering the approach of making it being good and economically the front

face of thermal break covering metal mold the shape of a crimp.
[0006]
[Means for Solving the Problem] That is, this invention is the process of the synthetic-resin molding die which covers the die wall side which forms the mold cavity of the main metal mold which consists of a metal with the thermal break of 0.05-1mm thickness which consists of a heat-resistant polymer, uses a photopolymer for this thermal break front face further, and forms a crimp-like detailed irregularity front face.
[0007] Furthermore, this invention is the process of the above-mentioned metal mold with which a photopolymer consists of photosensitive polyimide. By covering the front face of the main metal mold which consists of a metal with the thin thermal break which consists of synthetic resin, there is many well-known reference about the approach of improving mold surface repeatability of mold goods. However, although the count of shaping can use metal mold, such as this, for little shaping as simple metal mold conventionally, it is old common sense to form a mold cavity in the authentic metal mold which is equal to tens of thousands of shaping with the tough quality of the materials, such as steel. With injection molding, since synthetic resin is injected in the mold cavity of the thin meat of 2mm thickness extent at high speed, it is considered to be indispensable until now with the authentic metal mold which performs tens of thousands of shaping to form a mold cavity with the tough quality of the materials, such as steel.
[0008] Even if we did still deeper research about this and covered the front face of the main metal mold with thin synthetic resin, when using the thermal break which consists of the synthetic resin which fulfills certain conditions, we discovered bearing tens of thousands of times of injection molding. That is, in injection molding, the heating plasticization resin injected by metal mold contacts the cooled metal mold wall surface, and forms a flozen layer in the contact surface immediately, and if the resin injected succeedingly runs between a flozen layer and flozen layers and reaches at the tip of a flow (flow front), it will serve as a flozen layer in contact with a metal mold wall surface toward the direction of a metal mold wall surface. That is, the resin injected flows so that a metal mold wall surface may be forced from a top, pulls a metal mold wall surface and does not flow to Mr. ****. Therefore, when covering with the thin thermal break which consists of the synthetic resin which had the metal mold front face chosen, it found out that this thermal break was not directly worn out by the resin injected, and could bear tens of thousands of times of injection molding.
[0009] This invention shows how to make the front face of the thermal break covering metal mold excellent in this endurance the shape of a good crimp. This invention is explained in detail below. The synthetic resin used for the metal mold manufactured by this invention method is thermoplastics which can be used for general injection molding, blow molding, etc., and is styrene resin, such as polyolefines, such as polyethylene and polypropylene, polystyrene, a styrene acrylonitrile copolymer, and rubber strengthening polystyrene, a polyamide, polyester, a polycarbonate, methacrylic resin, vinylchloride resin, etc. In synthetic resin, 1 - 60% of resin strengthening object can also be contained. Resin strengthening objects are inorganic powder, such as various fiber, such as various rubber, a glass fiber, and carbon fiber, talc, a calcium carbonate, and a kaolin, etc. It is rubber strengthening synthetic resin that it can especially be used good, and it is rubber strengthening styrene resin which can be used still better in it. Rubber strengthening polystyrene, ABS plastics, AAS resin, MBS resin, etc. can be used the best.
[0010] The mold goods fabricated with the metal mold produced by this invention are synthetic-resin injection-molded products generally used, such as housing, such as a light electric appliance machine and electronic equipment, various daily necessaries, and various industrial components, are fabricated at the multipoint gate and can be applied to the mold goods which many weld lines generate good. The metal metal mold currently generally [the main metal mold which consists of metal mold stated to this invention / the alloy which uses as a principal component the steel materials, aluminum, or aluminum which uses iron or iron as a principal component, a zinc alloy, a beryllium-copper alloy, etc.] used for shaping of synthetic resin is included. The metal mold which especially consists of steel materials can use it good.

[0011] Glass transition temperature is 160 degrees C or more, and 140 degrees C or more of 230 degrees C or more of melting points of the heat-resistant polymer used for a thermal break by this invention are a heat-resistant polymer 250 degrees C or more preferably. Generally the thermal conductivity of a heat-resistant polymer is 0.0001-0.002cal/cm-secand**, and is sharply smaller than a metal. Moreover, whenever [breaking extension / of this heat-resistant polymer] has the preferably desirable polymer which has still more preferably 10% or more of 15% or more of toughness 5% or more. Performing the measuring method of whenever [breaking extension] according to ASTMD638, the hauling rate at the time of measurement is a part for 5mm/.

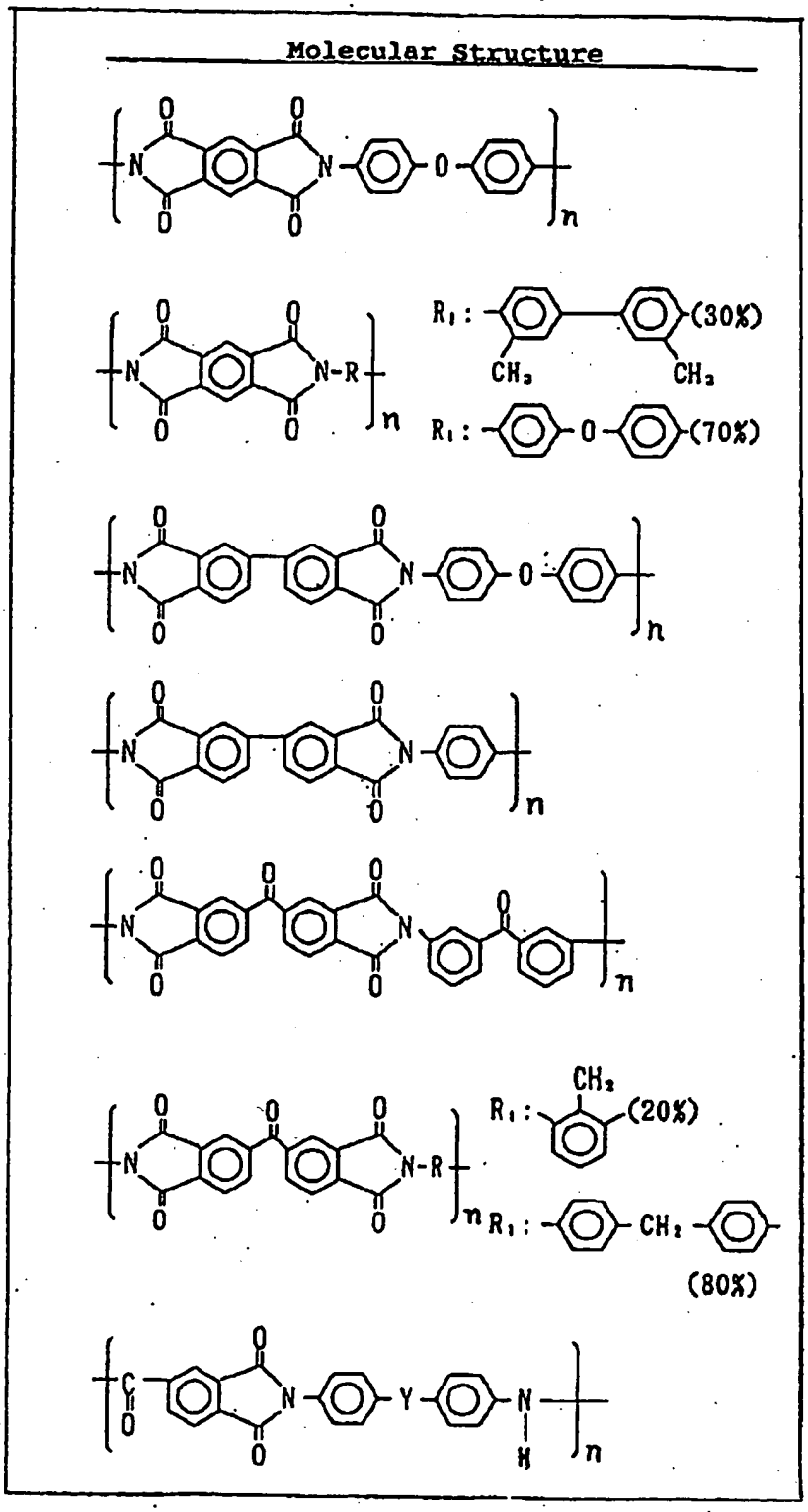
[0012] Various amorphous heatproof polymers, various polyimide, etc. which are the heat-resistant polymer which has a ring in a principal chain, and dissolve in an organic solvent can use the polymer which can be used good as a thermal break by this invention good. As an amorphous heatproof polymer, they are polysulfone, polyether sulphone, the poly allyl compound sulfone, polyarylate, polyphenylene ether, etc.

[0013] polyimide -- various **** -- the amount polyimide of straight chain mold macromolecules, and a part -- the polyimide of a bridge formation mold can use it good. Generally, whenever [breaking extension] is greatly tough, is excellent in endurance, and can use especially the amount polyimide of straight chain mold macromolecules good. The amount polyimide of straight chain mold macromolecules shown in Table 1 can be used good.

[0014]

[Table 1]

Molecular Structure



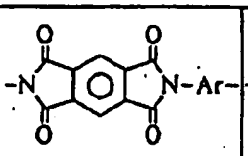
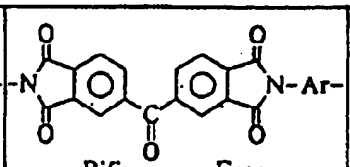
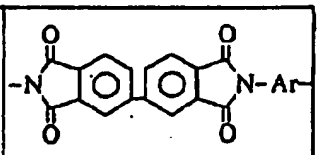
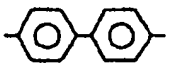
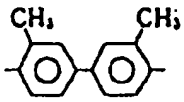
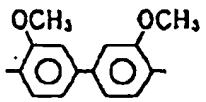
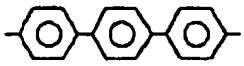
[0015] Furthermore, in this invention, it is so desirable that the coefficient of thermal expansion of a thermal break and the main metal mold is near. The coefficients of thermal expansion of a thermal break are 4 or less times of the coefficient of thermal expansion of the main metal mold, and 0.5 or more

times, are 3 or less times and 0.6 or more times still more preferably, and are 1.5 or less times and 0.8 or more times most preferably. In injection molding of synthetic resin, if a line crack differs [heating/cooling] from a coefficient of thermal expansion greatly repeatedly during shaping, stress will occur. Moreover, also when covering the main metal mold with a thermal break, heating/cooling is performed and stress occurs. If it becomes beyond a value with this stress, it will result in exfoliation of a thermal break. The example of the coefficient of thermal expansion of low-fever expansion polyimide is shown in Table 2. Various low-fever expansion polyimide can be used good.

[0016]

[Table 2]

低熱膨張ポリイミドの熱膨張係数 [$10^{-6}K^{-1}$]

						
	Bifix	Free	Bifix	Free	Bifix	Free
	—	—	2.10	4.34	0.26	1.90
	0.59	1.83	2.17	4.37	0.54	0.92
	0.20	0.64	1.54	4.44	0.56	—
	1.37	2.29	4.91	6.37		5.28
	0.56	0.94	1.83	3.10	0.59	1.38

[0017] Injection molding has economic merit in the place once obtained with shaping in the mold goods of a complicated configuration. It is most desirable to cover this complicated metal mold front face with a heat-resistant polymer, and to apply a heat-resistant polymer solution and/or a heat-resistant polymer precursor solution, to heat subsequently, in order to make it stick firmly, and to make a heat-resistant polymer form. Therefore, as for the heat-resistant polymer or the heat-resistant polymer precursor of this invention, it is desirable that it can dissolve in a solvent.

[0018] The epoxy resin with which flexibility was given, silicone system resin, melamine system resin, etc. can be used good similarly. The modified epoxy resin with which especially flexibility was given can be used good. The large thing of the adhesion force of the thermal break of this invention and the main metal mold is desirable, and more than 0.5kg / 10mm width are more than 1kg / 10mm width especially preferably more than 0.8kg / 10mm width desirable still more preferably at a room temperature. This is the exfoliation force when cutting the stuck thermal break to 10mm width, and pulling the rate for 20mm/in an adhesion side and the direction of a right angle. Although variation is considerably seen by the measurement location and the measurement count, it is important that the minimum value is large, this exfoliation force is stabilized and it is desirable that it is the large exfoliation force. The adhesion force stated to this invention is the minimum value of the adhesion force of the principal part of metal mold.

[0019] The thickness of a thermal break is moderately chosen in 0.05 to 1mm. It is 0.1 to 0.5mm

especially preferably. The main metal mold front face is covered with the thermal break which consists of heat resistant resin, and if the heating resin injected on the thermal break front face contacts, in response to the heat of resin, the temperature up of the mold front face will be carried out. Mold skin temperature becomes high, so that a thermal break is so thick that the thermal conductivity of a thermal break is small. After contacting the mold front face on which the injected synthetic resin was cooled in this invention, it is desirable for at least 0.1 seconds that it is in the condition more than the softening temperature of the resin with which mold skin temperature is fabricated. Although most mold skin temperature turns into a main die temperature and the same temperature after 0.01 seconds when there is no thermal break in a mold front face, it is covering with the thermal break of moderate thickness, and it comes out to change the mold front face between at least 0.1 seconds into the condition more than softening temperature.

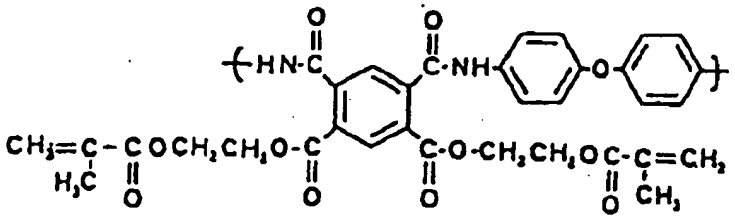
[0020] Change of the mold skin temperature at the time of injection molding is calculable from synthetic resin, the main metal mold, the temperature of a thermal break, the specific heat, thermal conductivity, a consistency, the crystallization latent heat, etc. For example, it is calculable in the nonsteady-heat-conduction analysis by the nonlinear finite element method using ADINA, ADINAT (software developed in Massachusetts Institute of Technology), etc.

[0021] The softening temperature of the resin described here is the temperature which synthetic resin may deform easily, and it considers as BIKATTO softening temperature (ASTM D1525) and the temperature shown [by heat deflection temperature (18.6kg/cm2 of ASTM D648 loads), and elasticity crystalline polymer] at hard crystalline polymer, respectively with heat deflection temperature (4.6kg/cm2 of ASTM D648 loads) by amorphous resin. Hard crystalline polymer is polyoxymethylene, nylon 6, Nylon 66, etc., and elasticity crystalline polymer is various polyethylene, polypropylene, etc. The photopolymer stated to this invention is resin which bridge formation takes place to resin by ultraviolet rays etc., and becomes insoluble. Since the photopolymer of this invention is used as a thermal break of the front face of metal mold, like the aforementioned thermal break, it is tough and its resin with thermal resistance is desirable. The most desirable photopolymer is photosensitive polyimide. Typical photosensitive polyimide is shown in the following-ization 1.

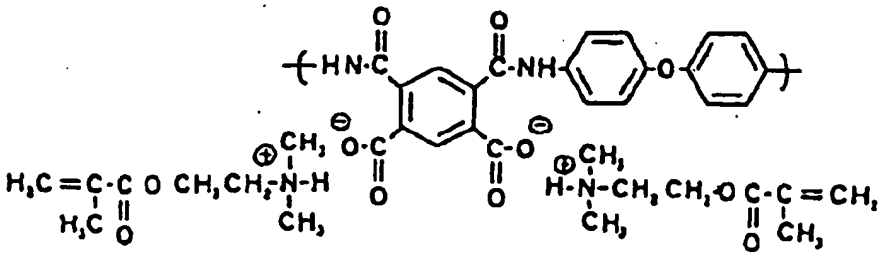
[0022]

[Formula 1]

a エステル結合型感光性ポリイミド



b イオン結合型感光性ポリイミド



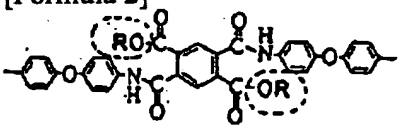
[0023] It is the precursor of polyimide, and this photosensitive polyimide causes bridge formation by ultraviolet rays, becomes insoluble, it forms an imide ring by the heating cure subsequently performed, and serves as high heat resistant resin. As typical photosensitivity polyimide, there are ester mold photosensitivity polyimide and ion mold photosensitivity polyimide. A photopolymer is applied to the front face of the thermal break of thermal break covering metal mold in this invention, a bridge is constructed and the part which irradiated ultraviolet rays and carried out UV irradiation the shape of a crimp moderate subsequently is made insoluble, subsequently the part non-constructed a bridge is dissolved with a solvent, it removes, subsequently a heating cure is carried out, and it considers as crimp-like high heat resistant resin.

[0024] The shape of a crimp stated to this invention is a large and small hide crimp, a hairline-like crimp, etc., and is various crimps currently generally used for the injection molding die of synthetic resin. This invention is explained using a drawing. Drawing 1 shows each process of the process of the metal mold of this invention. Drawing 2 -5 show the calculated value of change of the temperature distribution near a metal mold wall surface when injection molding of the temperature of 50 degrees C and rubber strengthening polystyrene is carried out at 240 degrees C in the main die temperature.

[0025] In drawing 1 , the die wall side which constitutes the metal mold cavity of the metal mold 1 (1-1) which consists of a metal is covered with the thermal break 2 which consists of a heat-resistant polymer (1-2). The photosensitive polyimide 3 shown in the following-ization 2 is applied to the front face of this thermal break 2 (1-3). The crimp-like masking film 4 is stuck on the front face of the applied photosensitive polyimide 3 (1-4). Ultraviolet rays are exposed from a front face (1-5). As shown in the following-ization 3, bridge formation takes place, and the photosensitive polyimide 5 of the part exposed by ultraviolet rays becomes insoluble at a solvent. The part of the photosensitive polyimide which was not exposed is dissolved and removed with a solvent (1-6). The thermal break covering metal mold which has the crimp-like front face which uses as the polyimide 6 which performs a heating cure, finally forms an imide ring, and is shown in the following-ization 4, and this invention makes the purpose is obtained (1-7).

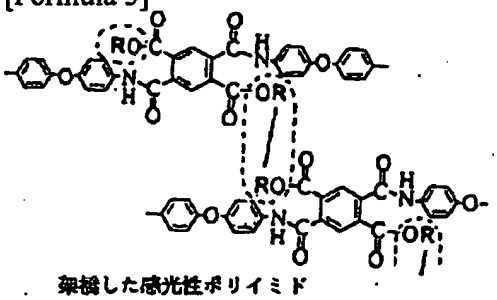
[0026]

[Formula 2]



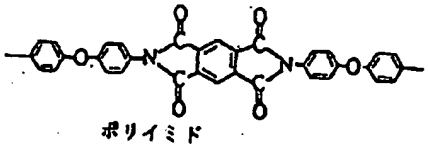
[0027]

[Formula 3]



[0028]

[Formula 4]



[0029] The magnitude of surface irregularity can be adjusted with the thickness of the photosensitive polyimide to apply. The configuration of a crimp can be adjusted with a masking film. The polyimide 6 formed from photosensitive polyimide needs to be stuck to the thermal break 1. In order to raise the adhesion of the polyimide 6 formed from a thermal break 1 and photosensitive polyimide, especially the thing imide-ized 100% together by the heating cure when this polyimide also using further the semi-hardening polyimide with which one half extent formation of the imide ring was carried out by using the polyimide formed in the thermal break 1 from the amount polyimide precursor solution of straight chain mold macromolecules, and moving from drawing 16 to drawing 17 is desirable.
[0030] since it will be fabricated while a mold front face is heated by the thermal break with injection resin if it fabricates using the thermal break covering metal mold of this invention -- mold goods -- the repeatability of the crimp configuration on the front face of a mold -- good -- therefore, a weld line etc. -- being also conspicuous -- it will decrease and post processing, such as paint finishing, can be omitted. Next, it is shown that a mold front face carries out a temperature up using drawing 2 - drawing 5 at the time of shaping.
[0031] Drawing 2 , drawing 3 , drawing 4 , and drawing 5 show the calculated value of change of the temperature distribution near a metal mold wall surface when injection molding of the temperature of 50 degrees C and rubber strengthening polystyrene is carried out at 240 degrees C in the main die temperature. The numeric value of each curve in drawing shows the time amount (second) after contacting the metal mold wall with which the heated synthetic resin was cooled. The heated synthetic resin contacts a die wall side, and is cooled quickly, and the temperature up of the mold front face is carried out in response to heat from the heated synthetic resin. If a metal mold front face is covered with a thermal break (polyimide) as shown in drawing (drawing 3 and drawing 4), the temperature rise on the front face of a thermal break in contact with synthetic resin will become large, and a temperature fall rate will also become small.
[0032] Mold skin temperature becomes high and effectiveness equivalent to having raised the die temperature sharply by thermal break covering is acquired, so that the time amount after synthetic resin contacts a metal mold wall is short, when covered with a thermal break. The number of seconds in drawing can show the number of seconds which has passed after synthetic resin contacted the mold front face, and can read mold skin temperature in case a high angle appearance pressure is applied to a contact front face in this curve.
[0033] It is shown how drawing 5 changes with the time amount after resin contacts [the temperature on the front face of polyimide of a thermal break] at this front face. 0.4 seconds after resin contacts a mold front face, for maintaining a mold front face more than the softening temperature of synthetic resin, it is necessary to cover polyimide in the thickness exceeding 0.1mm. Although this changes with a die temperature, softening temperature of synthetic resin, etc., the softening temperature of the synthetic resin which a die temperature is fabricated near 50 degree C, and is generally used is more than near 100 degree C. Although injection molding mainly explained this invention, it is the same by other fabricating methods, such as blow molding.
[0034]
[Example] The following main metal mold, polyimide, and photosensitive polyimide are used.
The main metal mold: It is built with steel materials (S55C), and has a plate-like mold cavity with a square of a 100mmx100mm and a thickness of 2mm, and a mold front face is a mirror plane-like. It has the mirror plane-like chrome plating of 0.02mm thickness on this front face.
Polyimide precursor: A straight chain mold polyimide precursor, a polyimide varnish "TORENISU **3000" (trade name by Toray Industries, Inc.). Tg of the polyimide after hardening is 60% whenever

[300 degrees-C and breaking extension].
Photosensitive polyimide: Photosensitive polyimide "a pie mel" (trademark by Asahi Chemical Industry Co., Ltd.). Tg of the polyimide after hardening is 300 degrees C, and whenever [breaking extension] is 30%.
[0035] A polyimide precursor solution is applied to the main metal mold, it heats at 160 degrees C, subsequently this actuation is repeated 7 times, and the thermal break of 0.14mm thickness is formed. Since this thermal break is heated at 160 degrees C, it is polyimide formed into one half imide. Next, the thermal break covering metal mold which has a hide crimp-like front face is manufactured using the process shown in drawing 1 . Finally the heating cure shown in drawing 17 is performed at 300 degrees C, and the thermal break covering metal mold which has the hide crimp-like front face on which a thermal break and photosensitive polyimide were united is manufactured. When injection molding was carried out with rubber strengthening polystyrene using this thermal break covering metal mold, the injection-molded product with very little ****** of a weld line was obtained.
[0036]
[Effect of the Invention] By this invention method, when a mold front face manufactures crimp-like thermal break covering metal mold and carries out injection molding with this metal mold, mold goods with very little ****** of a weld line are obtained. These mold goods make it possible to omit post processing, such as paint, and are greatly useful.

[Translation done.]

1. The appeal brief filed is defective as the copy of the claims is incorrect.

There is no clean copy of claim 26.

In claims 28 and 29, the subparagraphs (a) through (f) are improperly identified as (g) through (l). (there are no subparagraphs preceeding (g))

To avoid dismissal of the appeal, appellant must ratify the appeal brief within ONE MONTH or THIRTY DAYS from the mailing of this communication, whichever is longer. Extensions of time may be granted under 37 CFR 1.136.

The applicant is directed to file a new appeal brief with clean copies of the claims together with an after final amendment limited to the corrections to the claims discussed above and showing the changes.

2. A corrected copy of the examiner's answer accompanies this mailing as well as a copy of the machine translation of JP 08-039572.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J. Angebranndt whose telephone number is 571-272-1378. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Martin J Angebranndt
Primary Examiner
Art Unit 1756

****
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